

WHAT IS CLAIMED IS:

1 1. A gas sensor abnormality detecting device made to detect the presence or
2 absence of abnormality of a gas sensor having a cell in which a pair of electrodes
3 are formed on a solid electrolyte material to output a signal corresponding to a
4 composition of a measured gas on surfaces of said electrodes through a signal line
5 connected to said electrodes, said device comprising:

6 signal inputting means for temporarily inputting a test signal including an
7 alternating-current component through said signal line to said cell undergoing
8 abnormality detection;

9 response signal detecting means for detecting a response signal developing
10 in said signal line in response to the inputting of said test signal; and

11 decision means for comparing a detection value of said response signal
12 with a prescribed value and, if said detection value resides in one of regions
13 defined by said prescribed value, making a decision that a disconnection
14 abnormality occurs in said cell undergoing the abnormality detection.

1 2. The device according to claim 1, wherein, for the detection of said
2 response signal, a predetermined time delay is set with respect to said test signal.

1 3. A gas sensor abnormality detecting device made to detect the presence or
2 absence of abnormality of a gas sensor composed of a plurality of cells each
3 having a pair of electrodes formed on a solid electrolyte material to output a gas
4 detection signal corresponding to a composition of a measured gas at surfaces of
5 said electrodes through a signal line connected to the electrodes and made such
6 that one electrodes of said pairs of electrodes of said plurality of cells are placed
7 to confront a common chamber, said device comprising:

8 test signal inputting means for temporarily inputting a test signal including
9 an alternating-current component through the signal lines to a specified cell of
10 said plurality of cells;

11 response signal detecting means for, in response to the inputting of said
12 test signal, detecting a response signal developing in said signal line for a cell,
13 undergoing abnormality detection, other than said specified cell; and
14 decision means for comparing a detection value of said response signal
15 with a prescribed value and, if said detection value resides in preset one of regions
16 defined by said prescribed value, making a decision that a disconnection
17 abnormality occurs in said cell undergoing the abnormality detection.

1 4. The device according to claim 3, further comprising second response
2 signal detecting means for, in response to said test signal with respect to said
3 specified cell, detecting a response signal developing in a signal line for said
4 specified cell; and
5 second decision means for comparing a detection value of said response
6 signal with a prescribed value to, if the detection value resides in preset one of the
7 regions defined by said prescribed value, make a decision that a disconnection
8 abnormality occurs in said specified cell.

1 5. The device according to claim 4, further comprising:
2 response signal detecting means for, in response to the inputting of said
3 test signal to said specified cell, detecting a response signal developing in a signal
4 line for the specified cell;
5 impedance calculating means for obtaining an impedance between said
6 electrodes of said specified cell on the basis of said test signal and said response
7 signal; and
8 heater control means for controlling a heater integrated with gas sensor
9 together with the cell on the basis of the obtained impedance.

1 6. The device according to claim 1, further comprising:

2 temperature state detecting means for detecting a temperature state of said
3 solid electrolyte material; and
4 inhibiting means for inhibiting the abnormality decision processing in said
5 decision means until said temperature state reaches a predetermined temperature
6 region of said solid electrolyte material.

1 7. The device according to claim 6, wherein said temperature state detecting
2 means obtains an impedance between said electrodes on the basis of said test
3 signal and said response signal, with said impedance being used as a parameter for
4 said temperature state.

1 8. The device according to claim 1, wherein said test signal inputting means
2 inputs a temporary voltage variation as said test signal to said signal line, and said
3 response signal detecting means detects a variation of a current flowing through
4 said signal line as said response signal, and said decision means sets, as said one
5 region, a smaller region than said prescribed value and, when said detection value
6 falls below said prescribed value, makes a decision that a disconnection
7 abnormality occurs in said cell undergoing the abnormality detection.

1 9. The device according to claim 1, wherein said test signal inputting means
2 inputs a temporary current variation as said test signal to said signal line, and said
3 response signal detecting means detects a variation of a voltage in said signal line
4 as said response signal, and said decision means sets, as the one region, a larger
5 region than said prescribed value and, when said detection value exceeds said
6 prescribed value, makes a decision that a disconnection abnormality occurs in said
7 cell undergoing the abnormality detection.

1 10. A gas sensor abnormality detecting device made to detect the presence or
2 absence of abnormality of a gas sensor composed of a cell having a pair of

3 electrodes formed on a solid electrolyte material to output a gas detection signal
4 corresponding to a composition of a measured gas on surfaces of said electrodes
5 through a signal line connected to said electrodes, said device comprising:
6 test signal inputting means for temporarily inputting a test signal including
7 an alternating-current component through said signal line with respect to a cell
8 undergoing abnormality detection;
9 response signal detecting means for, in response to the inputting of said
10 test signal, detecting a response signal developing in said signal line;
11 impedance calculating means for obtaining an impedance between said
12 electrodes on the basis of said test signal-and said response signal; and
13 decision means for comparing the obtained impedance value with a
14 prescribed value and, if the obtained impedance value exceeds said prescribed
15 value, making a decision that a disconnection abnormality occurs in said
16 undergoing abnormality detection.

1 11. The device according to claim 10, further comprising:
2 temperature state detecting means for detecting a temperature state of said
3 solid electrolyte material; and
4 inhibiting means for inhibiting the abnormality decision processing in said
5 decision means until said temperature state reaches a predetermined temperature
6 region of said solid electrolyte material.

1 12. The device according to claim 11, wherein said temperature state detecting
2 means obtains an energizing time with respect to a heater integrated with said gas
3 sensor together with said cell, with said energizing time being used as a parameter
4 for said temperature state.

1 13. The device according to claim 11, wherein said temperature state detecting
2 means obtains a total applied electric energy to a heater integrated with said gas

3 sensor together with said cell, with said total applied electric energy being used as
4 a parameter for said temperature state.

1 14. The device according to claim 1, wherein said test signal inputting means
2 constitutes a power supply of said cell and temporarily inputs one of a voltage
3 variation and a current variation to said signal line, and said response signal
4 detecting means detects one of a variation of a current flowing through said signal
5 line and a variation of a voltage between said electrodes as said response signal.

1 15. The device according to claim 14, wherein said test signal inputting means
2 inputs one of a voltage and a current varying in both a positive and negative
3 directions with respect to one of a voltage and a current immediately before.

1 16. The device according to claim 14, wherein said test signal inputting means
2 inputs one of a voltage and a current varying in one of a positive and negative
3 directions with respect to one of a voltage and a current immediately before.